**CTR ACTIVITY**

By: Jason Fisher and Bushra Anwar

**Specific Expectation**

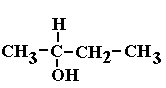
Explain the concept of isomerism in organic compounds, and how variations in the properties of isomers relate to their structural and molecular formulae.

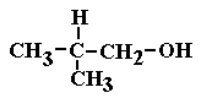
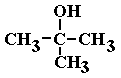
**Instructions**

Each student is provided with a piece of construction paper inscribed with the structural formula of a chemical compound. Students walk around the class looking for other students who are in possession of the isomers for their given chemical compound. All students with isomers of one molecular formula will form a group. The groups will settle at their respective stations, where clue sheets are placed. Students will use the clues provided on the sheet to arrange their structures in the correct order, from left to right, i.e., #1 🡪 #2 🡪 #3 🡪# 4 and so on. After arranging all the pieces in the right order, students will flip over their arranged pieces to check if they got an encouraging word/phrase. Once the students have solved the puzzle for their set of isomers, they will scramble the puzzle pieces and pass them, along with the clues sheet, to another group. In this way, all students will get a chance to go through the puzzles for every set of isomers.

***Five sets of isomers and the respective clue sheets required for solving the puzzles are given in the next few pages. Solutions to the puzzles are also provided.***

**Set #1: Isomers of C4H10O**

**Clues for solving the puzzle**

**#1** has the lowest boiling point among alcohol isomers and it cannot be readily oxidized to a ketone.

**#2** has the highest boiling point among alcohol isomers.

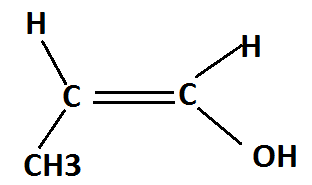
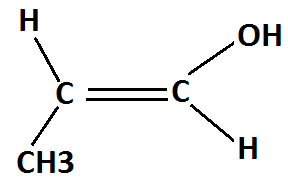
**#3** oxidizes to form a ketone while **#6** is oxidizes to form an aldehyde.

**#4** and **#5** are quite unreactive.

**#5** can be prepared from the condensation reaction of two ethanols.

**Set #2: Isomers of C3H6O**

**Clues for solving the puzzle**

**#2** is a cis-isomer but **#3** is a trans-isomer.

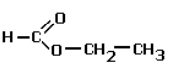
**#4** is most easily oxidized to a carboxylic acid while **#5** is not.

**#6** has the lowest boiling point.

**#5** is less soluble in water than **#1**.

**Set #3: Isomers of C3H6O2**



**Clues for solving the puzzle**

**#1** has the highest boiling point.

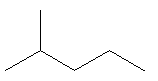
**#2** shows acidic properties

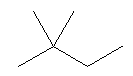
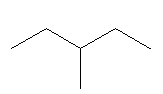
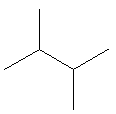
**#3** and **#1** consists of two functional groups.

**#5** hydrolyses to give ethanoic acid while **#4** hydrolyses to form methanoic acid.

**#3** reacts with a carboxylic acid to form ester while **#2** does not.

**Set #4: Isomers of C6H14**

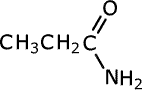
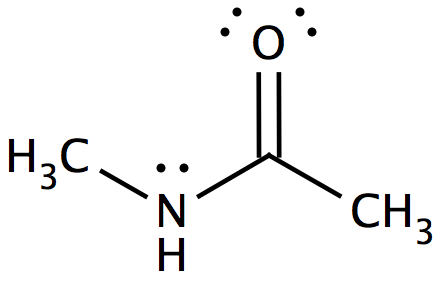
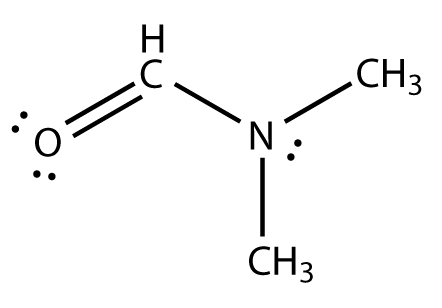
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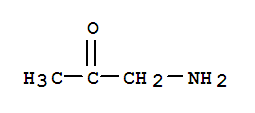
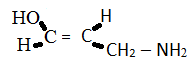
**Clues for solving the puzzle**

Boiling point of **#1** > Boiling point of **#2** > Boiling point of **#3** > Boiling point of **#4** > Boiling point of **#5**

**Set #5: Isomers of C3H7NO**



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**Clues for solving the puzzle**

**#1** formed from a reaction between ethanoic acid and methylamine, while **#6** is formed

from a reaction between methanoic acid and N-methylmethanamine.

**#3** is the stereoisomer (*cis-trans* isomer) with the higher boiling point, while **#4** is the stereoisomer with the lower boiling point.

Of the two compounds containing both a carbonyl group and an unsubstituted amine (-NH2), **#2** has the higher boiling point, and **#5** has the lower boiling point.

**Solutions of Puzzles**

**Puzzle #1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#1** | **#2** | **#3** | **#4** | **#5** | **#6** |
|  |  |  |  |  |  |

**Puzzle #2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#1** | **#2** | **#3** | **#4** | **#5** | **#6** |
|  |  |  |  |  |  |

**Puzzle #3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#1** | **#2** | **#3** | **#4** | **#5** |
|  |  |  |  |  |

**Puzzle #4**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#1** | **#2** | **#3** | **#4** | **#5** |
|  |  |  |  |  |

**Puzzle #5**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **#1** | **#2** | **#3** | **#4** | **#5** | **#6** |
| http://www.chemeddl.org/alfresco/d/d/workspace/SpacesStore/b7968013-2fe6-4c36-8dc9-1043d8b8b4bb/n_methylacetamide.png?guest=true  C C | propanamide structure |  |  | http://www.lookchem.com/300w/2010/0620/298-08-8.jpg | http://www.chemeddl.org/alfresco/d/d/workspace/SpacesStore/21764091-079d-4a71-8117-2588731719bd/N_N-dimethylformamide-lewis.png |